Journal of Theoretical Educational Science, 18(2), 322-344, April 2025
Kuramsal Eğitimbilim Dergisi, 18(2), 322-344, Nisan 2025
[Online]: http://dergipark.org.tr/akukeg
DOI number: http://doi.org/10.30831/akukeg.1595607

A Study on Developing Basic Process Skills for Preschool Children with Context-Based Science and Nature Activities*

Okul Öncesi Çocuklarına Bağlam Temelli Fen ve Doğa Etkinlikleri ile Temel Becerilerin Kazandırılmasına Yönelik Bir Araştırma

Hatice ALTINOK ** **Bülent AYDOĞDU** *** **Fatma Betül ŞENOL** ****

Received: 3 December 2024 **Research Article** **Accepted:** 6 March 2025

ABSTRACT: The aim of this research was to provide preschool children with context-based science and nature activities and basic process skills. The research was carried out with 11 children aged 48-60 months in the second term of the 2019-2020 academic years. The research was designed according to action research, one of the qualitative research designs. In the research, context-based science and nature activities planned by the researcher were applied. The Basic process skills Scale for Preschool Students, observation, interview, and diary were used as data collection tools. As a result of the study, it was determined that science and nature activities developed based on context-based learning are effective in gaining basic process skills in preschool. From this point of view, it can be recommended to implement activities suitable for context-based learning in different environments. Preschool teachers who want to gain basic process skills can be recommended to use context science and nature activities.

Keywords: Science and nature activities, context-based learning, action research, preschool, basic process skills.

ÖZ: Araştırmanın amacı, okul öncesi çocuklarına bağlam temelli fen ve doğa etkinlikleri ile temel beceriler kazandırmaktır. Araştırma, 2019-2020 eğitim-öğretim yılı ikinci döneminde 48-60 aylık on bir çocuklarla gerçekleştirilmiştir. Araştırma, nitel araştırma desenlerinden eylem araştırmasına göre desenlenmiştir. Araştırmada, araştırmacının planladığı bağlam temelli fen ve doğa etkinlikleri uygulanmıştır. Veri toplama aracı olarak Okul Öncesi Öğrencilerine Yönelik Temel Beceri Ölçeği, gözlem, görüşme ve günlük kullanılmıştır. Çalışmanın sonucunda, bağlam temelli öğrenmeye dayalı olarak geliştirilen fen ve doğa etkinliklerinin okul öncesinde temel becerilerin kazandırılmasında etkili olduğu tespit edilmiştir. Bağlam temelli etkinlikler, günlük yaşamla ilişkilendirilen uygulamalardan oluştuğu için çalışmada öğrenmede kalıcılığı sağlamıştır. Buradan hareketle, bağlam temelli öğrenmeye uygun etkinliklerin farklı ortamlarda uygulanması önerilebilir. Temel becerileri kazandırmak isteyen okul öncesi öğretmenlerine bağlam fen ve doğa etkinliklerini kullanmaları önerilebilir.

Anahtar kelimeler: Fen ve doğa etkinlikleri, bağlam temelli öğrenme, eylem araştırması, okul öncesi, temel beceriler.

* This study was produced from the master's thesis of the first author under the supervision of the second author.

** *Corresponding Author*: Special Education Teacher, Burdur Provincial Directorate of National Education, Burdur, Türkiye, haticesaygili9115@gmail.com, https://orcid.org/0000-0002-5517-0037
*** Prof. Dr, Afyon Kocatepe University, Afyonkarahisar, Türkiye, baydogdu@aku.edu.tr, https://orcid.org/0000-0003-1989-6081
**** Assoc. Prof. Dr., Afyon Kocatepe University, Afyonkarahisar, Türkiye, fbetululu@aku.edu.tr, https://orcid.org/0000-0002-4844-4968

Citation Information
Altınok, H., Aydoğdu, B., & Şenol, F. B. (2025). A study on developing basic process skills for preschool children with context-based science and nature activities. *Kuramsal Eğitimbilim Dergisi [Journal of Theoretical Educational Science], 18*(2), 322-344.

ISSN: 1308-1659

Preschool period is the term when children get to know the environment and facts after the family. From the moment the child is in the mother's womb, he tries to recognize and make sense of the sounds, family, environment, substances and phenomena after the birth (Narimanovna, 2023). From the moment they are born, children use their senses of touch, sight, hearing and taste to understand and make sense of the environment (Backman et al., 2021). Children's senses should be developed by using scientific process skills in various activities in the preschool period (Abd Rauf et al., 2013).

Science activity is at the forefront of the activity types in which science process skills are used (Afandi et al., 2019; Eshach, 2006). Children are naturally curious individuals. Arrangements should be made in the activities considering their curiosity and developmental characteristics. It is important in science education to develop children's sense of curiosity and to enable them to think critically with open-ended questions. With open-ended questions, children can first make observations and then make predictions and inferences based on these observations. In this context, children can examine and classify what they have obtained to test their predictions and compare them by measurement. Thus, children can establish a scientific foundation through research and examination (Jirout & Zimmerman, 2015; Cabe Trundle, 2015). With science education, students can gain sensitivity in every subject and gain knowledge through experience (Erkoca Akköse, 2008; Rajagopalan, 2019). Science is the sum of technical, regular and static information covering the environment (Çilenti, 1985; Flowerdew, 1992; Maryanti et al. 2022).In addition, according to the Ministry of National Education Preschool Education Program, science activities aim to develop children's problem-solving skills by enabling them to use scientific methods, to enable them to learn through trial and error what they are curious about as environmentally sensitive individuals, to form the basis for science concepts, to develop creative and scientific thinking, communication skills and to provide children with process skills (MoNE, 2024). With science education in the preschool period, it is aimed for individuals to recognize the events that occur around and in nature, comprehend relationships, make observations, interpret information and to gain scientific process skills (Jirout & Zimmerman, 2015).

In the literature, scientific process skills are examined in two groups as basic process skills and high-level skills (Wellington, 1994; Saat, 2004). The American Commission for the Advancement of Science Education (AAAS) emphasizes that it is more important to plan activities in a way that will develop children's scientific thinking skills and at the same time provide them with basic process skills rather than simply transferring information to children from an early age (AAAS, 1997). Basic process skills form the basis of scientific activities during the preschool period. Science activities help children develop skills such as observation, measurement, data recording, prediction, classification, and inference (McFarlin, 2011). When we look at process skills in general, it is possible to see that each step is in interaction with each other. Basic process skills can also be used in activities organized according to high-level skills (Jirout & Zimmerman, 2015). In this direction, the Context-Based Learning Model, which deals with science process skills as a whole and enables the relevant acquisition (or context), should be implemented.

Context-based learning aims to enable children to relate to their own lives and increase their desire for learning by presenting scientific concepts with examples, events and situations from daily life (Gilbert, 2006). It places teaching at the center and allows real life to be adapted and applied to science (King, Winner & Ginns, 2011). Additionally, learning by concretizing an acquisition or concept with contexts from their own lives, despite learning in an abstract way, explains context-based learning (Binnie, 2004; Choi & Johnson, 2005).

In the activities prepared based on the context-based learning model, focusing on problem solving, recognizing the need for teaching-learning through different contextual ways, ensuring students' own learning and regulation, creating mutual learning through group work and alternative solutions, measurement, evaluation, and so on the principles of using skills are based on (Yam, 2005). When using a context-based learning model, contexts should be selected from daily life, they should be appropriate to children's level, what is to be learned should be felt as a need by the child, and children should be able to think of context and concepts by establishing a relationship between concepts and life (Yu et al., 2015). The Four Stage Model of Context-Based Learning consists of four steps in total: introduction, curiosity-planning, development and relationship building. In the introduction stage, the lesson starts with visuals or stories that are related to the subject and daily life and contain appropriate concepts. Students are involved in the process within the visual, story, topic or game presented in this way. In the curiosity-planning stage, children are encouraged to ask questions, and their learning situations are revealed. A discussion environment is created among the students. In the development stage, students are encouraged to do the activity related to the concepts in the visual, story or event presented in the introduction. Children are asked to make sense of the information they have gained from the discussion. In this process, activities such as modelling, experimentation, numerical problems and different worksheets can be done. In the relationship building stage, a relationship is established between the visuals, stories, topics and concepts in the introductory activity and the activities in the development. Relationships are establifirst researcherd with physical events in daily life and the teacher explains the parts that are not understood. Children report what they have learnt verbally by presenting what they have learnt. They associate the new information they learnt with their own lives. Since preschool children associate their new knowledge with their daily lives and learn through concretisation (visuals, games, stories, etc.), it was thought that this model could be applied (Altınok, 2020; Çepni et al., 2019; Kalafati et al. 2025).In this direction, it was aimed to provide preschool children with science and nature activities and basic process skills by using the Context-Based Four-Stage Learning Model.

In line with this purpose, this research basically sought answers to the following questions:

1. What are the current problems experienced by the preschool teacher and their children in the process of gaining basic process skills?

2. What are the design features of context-based science and nature activities that will solve these current problems?

3. What basic process skills can be gained to the preschool children through context-based science and nature activities?

4. What are the views of the preschool children on context-based science and nature activities?

5. What are the strengths of context-based science and nature activities?

6. What are the aspects of context-based science and nature activities that are open to improvement or change?

Method

Research Design

The study was designed as action research one of the qualitative research methods. Action research is a research approach that includes recognizing the problems encountered in daily life, seeing how the actions that provide useful solutions to the problems affect the problem, and trying again when they do not find the result sufficient (Stringer, 2013). Since action research offers a hands-on approach to solving a practical problem, it is aimed to provide preschool children with basic skills by implementing context-based activities. In this design, researchers and teachers intervene directly, receiving continuous feedback and evaluating practices to support children's development. In addition, the context-based approach enables to organise activities appropriate to the specific conditions of the school to support children's developmental processes (McNiff, 2013; Stringer, 2013).

Action Research Steps and Implementation Process

Determining the Problem of the Research

In order to determine the problem of the research, it was carried out through the category of studying the teaching strategy (Johnson, 2015). The researcher realized that the preschool group, which has its own class at the school where first researcher works, has a lack of basic process skills with the activities he has done due to the fact that they have just started school and they are a small age group, and he identified this issue as the problem of the research.

Data Collection

After the research problem was determined, a literature review was conducted to mature the problem. By examining the context-based learning models, the fact that the Four-Stage Model, which is one of the model types and has a simple and understandable structure, is adaptable to the development of preschool children, directly supports active learning and can use visual materials has been effective in the selection of this research as the application model. During the action research process, data were collected through a literature review and interviews.

Analysis and Interpretation of Data

The researcher first focused on how to develop the action plans. With the opinions of the experts and the consultant, it was thought that it would be useful for the researcher to include basic science fields in the context-based activities that the researcher would first plan. As a result of her research, according to the four-stage model, first researcher conducted context-based activities to attract attention with a visual or a play at the beginning. According to the studies first researcher planned in the

introduction, first researcher prepared studies that would arouse curiosity in students and make them plan. First researcher organized the development activity in accordance with the work first researcher planned in the introduction. In order to establish a relationship, first researcher planned for students to establish a connection between the introduction and development and to establish a relationship with their daily lives.

Developing the Action Plan

According to the analysis of the data, the researcher needs to develop an action plan for implementation. While an action plan is developed in action research, it is important that the researcher transfers the solution he finds to the problem into practice (Yıldırım & Şimşek, 2016, p. 314). For this research, according to the literature, 16 context-based science and nature activities were developed, 10 of them were implemented and a revised plan of one activity was implemented. While the activities were developed, plans were prepared by taking expert opinion from the preschool education specialist. In order for the plans to be distributed in a balanced way in the fields of science, four action plans had been developed in each field of science: life sciences, physical sciences, and ecology and earth-space sciences.

Developing the Monitoring Plan

After the implementation of the action plan, the camera and phone that recorded the video were prepared in order to be able to watch this application again later. It was planned to keep a researcher's diary at the end of each application and to record the observations in the application at the end of the research. Additionally, after each application, a video checklist was prepared in order to examine the applications in the validity committee (Gürgür, 2016; McNiff, 2013) Video recordings, observations and video checklists were intended for each application. The application was planned to be performed as a total of 32 hours of 16 activities and two lesson hours. A validity committee had been formed in order to ensure the healthy execution and supervision of the applications. The validity committee consists of academicians who are experts in the fields of preschool education, science education and curriculum development in education. It was decided that the members of the validity committee would review the comprehensiveness of each application and fill out the video checklist.

As of September 9, 2019, when the schools opened in the 2019-2020 academic year the researcher planned the activities by observing the children in his class for a period of time. Before and after the application, Aydoğdu and Karakuş (2017) considered applying the "Basic process skills Scale for Preschool Students" to determine the basic skill levels of the students by obtaining permission for the scale. He planned to do it as a pretest the day before the applications and as a posttest at the end of the applications.

It was planned that the committee will meet at two-week intervals and examine the activities implemented. In every committee meeting, the deficiencies in the applications and the things to be done were reported to the researcher. The researcher organized the next activities in line with the recommendations of the committee and implemented an activity by reviewing it.

Implementation of the Action Plan

In order to determine the level of children's basic process skills, Aydoğdu and Karakuş (2017) conducted a pretest with the "Basic process skills Scale for Preschool Students". Afterwards, the applications were applied twice a week, on Tuesday and Thursday. The first application was started on February 4, 2020, and on March 13, 2020, 10 applications and a revised plan were made, and the study was completed with a total of eleven applications. The applications were limited to 11 applications due to the global epidemic COVID-19, which is effective in the world, and in the following process, the posttest study was conducted by video chatting with the students. Then, individual interviews were made over the phone and the opinions of the students were taken about the applications.

Monitoring the Application

Video recordings were examined after each application in order within the framework of the developed monitoring plan. During the application process, students were observed, and notes were taken. For each application, the researcher logged his thoughts. By examining the pretest-posttest data, comments were made about the basic skill levels of the students. The opinions of the validity committee about the practices were taken into consideration and activities were organized in the context of these opinions. Afterwards, the data were analyzed one by one and the results of the research were drawn.

Analysis and Evaluation of the Implementation

Applications were analyzed separately. Before starting the application, the researcher tried to make up for the deficiencies by conducting research on context-based learning. In general, it had been concluded that the application is useful in solving the problem. Due to individual differences, the development of each children basic process skills differ. There was a significant change in the children’s basic process skills according to the differences in the participation and pretest-posttest scales they showed in the applications. Context-based science and nature activities helped preschool children acquire basic process skills.

Developing the New Action Plan

Apart from the planned implementations, the seventh implementation did not meet the measurement and inference skills, so the plan was revised, arranged and implemented. As the 10th application, in the plan, in which the revised version was applied, changes were made in the curiosity-planning and development steps, while the other steps remained the same. In the changed parts, it was considered that the measurement skill could be observed more easily and a level of expression that the students could understand.

Context of the Research

The research was applied in kindergarten where 36–60-month-old children study in the spring term of the 2019-2020 academic years. The practice school is a single-storey reinforced concrete structure and is shaped like a star type kindergarten. There are four kindergartens, a game room, a multi-purpose hall, a support training room, a principal's room and a kitchen in the building. The application class is also the class in

which the researcher works. The applications were carried out in the classroom environment and recorded with a video recorder. The camera was positioned at the corner of the teacher's desk and the practices were recorded by another teacher. The socio-economic structure of most of the families of the children was medium. Although the school was at a medium level in terms of development in terms of its conditions, its parent profile was open to development.

Participants

The research was carried out in the kindergarten where 36-60 month old children study in the spring term of the 2019-2020 academic year. The researcher gets to know the students closely, thanks to the fact that the researcher has a class in the school where he works. Additionally, the participants were given a pretest in turns and in groups. Since the class size is 11, the focus group was not selected and the whole class was included in the study. At the end of the applications, the researcher conducted individual interviews for the posttest study. Due to the confidentiality principle in the research, definitions were made by using different names instead of the names of the participants. The ages of the participants vary between 36-60 months as of September 2019. There are 11 participants in total in the class, 2 of which are 36-48 months old and 9 are 48-60 months old. Four of the participants were female and seven were male. In general, the number of siblings of the participants is one. Considering the educational status of the participants' families, the mothers graduated from one primary school, one secondary school, six high schools, and three undergraduate degrees; the fathers have two primary schools, four high schools, one associate degree, and four undergraduate degree graduates.

Researcher Role

Since the implementation class was the classroom where the researcher worked, the fact that first researcher knew the school and the class contributed to the process. As Becker (1958: 652) stated, the researcher played a role in the process as a participant observer, as first researcher did the application himself, researched and collected the data of the application himself. The researcher prepared the activity plans before the application and made the arrangements for the plans with the opinion of the consultant and the expert. Again, he informed the families before the application and ensured that the families signed the participation consent forms about the participation of the children in the application. First researcherFirst researcher observed the development of children with the pretest-posttest first researcher gave to the children. First researcher interviewed the children and got their views on the activities. First researcher presented the activities to the validity committee two weeks apart and guided the activities according to the committee's recommendations.

Data Collection Tools

Basic Process Skills Scale for Preschool Students

"Basic process skills Scale for Preschool Students" developed by Aydoğdu and Karakuş in 2017 was administered to children in sequence and in groups as a pretest and posttest. In this way, information about the existing basic process skills of the children was obtained. The basic process skills of the children were measured after the

application. The scale was prepared as 20 questions about observation, estimation, classification, measurement and inference skills. The cronbach alpha reliability coefficient of the scale was stated as 0.743 (Aydoğdu & Karakuş, 2017: 58).

Interview

During the research, after the applications, the participants' opinions were sought to get their thoughts on the process. The interview form was prepared and applied as semi-structured. First, three expert opinions were taken regarding the interview questions. One of the experts was a counselor, one was a preschool education specialist and the other was an education program specialist. Due to the global epidemic COVID-19, the last interviews were conducted via telephone. The interviews were conducted individually. Each interview lasted ten to fifteen minutes.

Observation

The observation technique, which is one of the basic data collection techniques of qualitative research was used as an observation type in which the researcher is both a participant and a practitioner (Moyles, 2002; Yıldırım & Şimşek, 2016). In the process, the applications were recorded on video and then examined by the researcher and documented. For video recording the camera was fixed to the table used by the teacher with a selfie stick. The researcher made macro analyses of the video recordings and presented these analyses in the validity committee meetings.

Researcher's Diary

A researcher's diary is a data collection technique that includes the researcher's personal notes such as feelings, thoughts, comments, explanations, observations and probabilistic situations about every situation that occurs during the research (Johnson, 2015: 327). For this research, the researcher wrote in his diary how he planned the activities, his observations in the application, the behaviors of the participants, the difficulties they encountered, their thoughts, feelings, short notes about the interviews and the decisions taken in the validity committee.

Analysis of Data

Since data analysis in action research requires continuity, it should be done while the research continues, that is, while the data is being collected. It is important to analyse the data to understand the application fully. In the analysis process, the researcher both puts forward various ideas and offers some suggestions about the problems encountered (McNiff, 2013; Yıldırım & Şimşek, 2016, p. 314).

Data analysis for this research was carried out in two stages, in the process and at the end of the process. At the end of each application, observation notes and a researcher's diary were kept. A video checklist was created by examining the video recordings of the applications. Descriptive analyses of these elements were made by comparing observations, diary notes and records for each application.

The differences in the pretest and posttest results of the scale were analysed quantitatively. Interview questions and answers were analysed as theme, sub-theme and code.

Credibility

In order to talk about the credibility of the research, first of all, the researcher must be in long-term interaction with the data sources (Ekiz, 2020; Yıldırım & Şimşek, 2016). In this context, the researcher interacts with data sources for a long time. The fact that the researcher makes eleven applications for the research is an indication that he is in long-term interaction with the sources. The fact that the researcher is also his own class is an important factor in getting used to it. The researcher gained the trust of the participants with his research over a long period of time. This enabled the researcher to obtain sufficient results in this study.

Depth-oriented data collection is a necessary method for the credibility of the research (Johnson, 2015; Yıldırım & Şimşek, 2016). In this research, the researcher was able to take a closer look at the events and results, as he was also a practitioner. He examined the applications with observations and video recordings and tried to verify the data by comparing the acquisition of skills with the pretest-posttest results in the applications.

Data diversity is an important way to ensure the credibility of action research (Mays & Pope, 2000; Yıldırım & Şimşek, 2016). In this research, different data sources and different data collection methods were used as a diversification method. Data for each application were collected at the appropriate time. The diversity of the data was provided with diaries, scale and interviews. The diversity of the data increased the credibility.

Expert review is also important for the credibility of a research (Houser, 2015; Yıldırım & Şimşek, 2016). In the research, the researcher presented what he had done intermittently from the beginning of the process to the expert opinion. The research which was evaluated by different experts was developed by the researcher in the context of these evaluations.

Ethical Procedures

Ethical approval was received from Afyon Kocatepe University Social And Human Sciences Scientific Research And Publication Ethics Board with the letter dated 11.01.2019 and numbered 2019/19.

Results

The results created by the analysis of the data collected during the research and implementation process were explained based on the research questions and the process.

Existing Problems Experienced by Preschool Teachers and Children in the Process of Gaining Basic process skills

It took time for the children to get used to the teacher and their friends, as it was their first semester at school. The existing problems before the application originated from the researcher and the student. Before the application, the researcher did not apply any context-based application examples to the students. It was observed that the students could not fully demonstrate the basic process skills in daily activities. The researcher did not work on basic process skills before the research. It was noticed that the students were able to make observations in the activities they carried out on daily concepts and subjects, but they did not have experience with other basic process skills. The fact that the researcher did not use remarkable materials in daily activities caused

the students to be distracted frequently. The researcher did not use different materials while reading the story about the subject or concept and read the story. This situation caused the students to get bored and distracted. The daily activities of the researcher were sometimes not in harmony, and the researcher applied activities that included different topics and 99 concepts during the day. When first researcher talked to the students about the activities in the following days, first researcher observed that the students' level of permanence in their learning was low. Although the researcher focused on students' understanding while applying the activities, he did not focus on basic process skills. Some students' achievements were lacking due to the fact that the students did not attend school regularly. Although materials were used in some activities, there were situations that did not attract the attention of some students. In the activity entries, the researcher did not always use appropriate materials or visuals to draw attention to the concept or subject. The researcher first started his activities with finger games or a moving game. Then he moved on to the activity on the subject. Because of this, the students could not establish a relationship between the introduction and the activity. Failure to establish the relationship caused students to be distracted and demotivated. Although examples suitable for the concept are given in each activity, contexts from daily life are not used. In this case, students could not relate to their lives.

Design Features of Context-Based Science and Nature Activities to Solve These Existing Problems

During the application process, a total of 11 science and nature activities were carried out according to context-based learning. The other 10 activities, one of which is the revised plan, are activities made according to different scientific fields. In the field of science, activities have been prepared in a balanced way according to the fields of physical sciences, life sciences, ecology, earth, and space sciences. The activities were organized according to the four-stage model of the context-based learning model. The four-stage model consists of four steps. The activities are planned according to these stages. At the introductory stage of the model, the activity started with images related to daily life. In curiosity planning, students were directed to ask questions and information about their learning situation was obtained. During the development phase, students were allowed to do the activity related to the visuals presented at the introduction. Students were asked to make sense of their knowledge by discussing. In establishing a relationship, a relationship was established between the visuals at the entrance and the activities in the development. New information learned is associated with their own lives. In this model, it was thought that it would be appropriate to use the stages due to the fact that the applicability of the stages is easier in preschool, it is supported with visuals, the stages are holistic, and it includes stages where children can be more active (Çepni, Özmen, & Ayvacı, 2019). It is extremely important for children to associate knowledge, facts, events and concepts with daily life in the preschool period for in-depth and permanent learning. Compared to other models, the Four-Stage Model includes stages that enable children to learn concepts more easily in the preschool period.

Basic Process Skills That Can Be Gained To Preschool Children With Context-Based Science And Nature Activities

The normality test was conducted for the scores of the "Basic process skills Scale for Preschoolers" of the preschool children in the study group. The skewness and kurtosis values in the scatter plots are taken into account. From the obtained scores, it was determined that the test did not meet the normality assumption ($p<0.05$). Since the related data did not show normal distribution, non-parametric tests were used in the analysis of the data. In Table 1, normality test results for the data obtained from the basic skill scale are given.

Table 1

Normality Test Results for the Data Obtained from the Basic Process Skills Scale

Scale score	pretest-posttest	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Total score for basic process skill scale		Statistic	df	Sig.	Statistic	df	Sig.
	1.00	.318	11	.003	.718	11	.001
	2.00	.155	11	.200*	.970	11	.891

According to Table 1, it is seen that the data are not normally distributed. For this reason, the Wilcoxon Signed Rank Test which tests the importance of the difference between the scores of the two related measurement tests was used in the pretest-posttest score comparisons of the children. Table 2 shows the descriptive statistics of preschool children's basic skill scale scores.

Table 2

Descriptive Data on Basic Process Skills Scale Scores for Preschool Children

Pretest-Posttest Scores	N	$\bar{X}$	sd
Basic process skills scale pretest scores	11	9.72	3.16
Basic process skills scale posttest scores	11	14.09	1.92

The children in the study group scored $\bar{X}$=9.72, sd.3.16 in the pretest and $\bar{X}$=14.09, sd.1.92 in the posttest of the Basic Process Skills Scale. In Table 3, Wilcoxon Signed Ranks Test results of preschool children's basic skill pretest and posttest scores are given.

Table 3

Wilcoxon Signed Rank Test Results of Pretest and Posttest Scores of Preschool Children's Basic Process Skills Scale

Posttest-Pretest	n	rank average	row sum	Z	p
negative order	0	0.00	0.00	2.812	0.005*
positive order	10	5.50	55.00		
Equal	0	4.06	0.61		

*$p < .05$

When Table 3 was examined, it was seen that there was a significant difference between the pretest-posttest scores of preschool children and this significant difference was in favor of the posttest ($z=2.812$, $p<0.05$).

Opinions of Preschool Children on Context-Based Science and Nature Activities

In this part of the research which includes the opinions of preschool students about context-based science and nature activities the analyses of the post-activity interviews with the students are presented. First of all, four themes were created from the answers given to the interview questions.

Table 4

Codes, Sub-themes and Themes Obtained from the Analysis of Children's Opinions

Theme	Sub-theme	Codes
Feelings in Science and Nature Activities	Positive Feelings	Getting excited Being happy Being good Being good Beautiful Curiosity
	Negative Feelings	Exhausting Find something Squeeze Classify Measurement Observe Investigate Creating a shadow
Tasks and Actions in Science and Nature Activities	Actions Taken	Put salt Dig Painting Pressing the shampoo Clean up Deadline Passing the red rope Courses
	Concepts	Activity Spider web Cartoon film Pudding Yoghurt
	Made with Milk	Rice Pudding

		Pasta
		Cheese
Relationships between Science and Nature Activities and Daily Life	Compass Reminders	Cream
		Map
		Compass
	Analogies Related to Blood Circulation	Clock Hose
		At
		Cherry juice Water
		Colour of tea
	Usage Areas of Stones	Pipe
		White stones
		Glass
Reminiscences from Science and Nature Activities	Concepts	Shadow and friend
		Compass
		Rotten and clean
		Big and small
		Slippery and lumpy
	Actions Taken	Tooth Brushing
		Boiling
		Hearing
	Materials Used	Clothing Sun
		Bone
		Spider
		Map
		Red rope
		Lemon and salt

In the semi-structured interviews with the students individually, the first question was, “What comes to your mind first as science and nature activities?”. The theme of "Science and Nature Activities" was created based on the interview question. The theme is divided into sub-themes as “concepts, actions taken, and materials used”. In the descriptive analyses conducted according to the interviews, codes such as "brushing teeth, clothes, sun, shadow and friend, egg and banana peels, compass, boiling, lemon and salt, bruised and clean, big and small, slippery and rough, hearing, bone, spider, map, and red rope" were identified with what children remembered about the activities.

In the semi-structured interviews with the children individually, the second question to the students was, "How did you feel?, Were you excited or curious while you were doing the activities?". The theme of "Feelings in Science and Nature Activities" was created based on the interview question. The theme is divided into sub-themes as “positive feelings and negative feelings”. In the descriptive analyses of the

interviews, codes such as "being excited, being happy, being good, beautiful, being curious, and tiring" were determined because of the children's feelings about the activities.

In the semi-structured interviews with the students individually, the third question was, “What did you do while applying the science and nature activities, like observation, measurement?”. The theme of "Duties in Science and Nature Activities" was created based on the interview question. The theme is divided into sub-themes as “actions and concepts”. In the descriptive analyses conducted according to the interviews, codes such as "lessons, activity, spider web, finding something, cartoon, squeeze, classify, measure, observe, investigate, create a shadow, put salt, dig, paint, press the shampoo, clean, end of time, pass the red string, and brush" were determined from the tasks mentioned by the children about the activities.

In the semi-structured interviews with the students individually, the fourth question was, “How did you establish a relationship between science and nature activities and daily life; What did you compare the concepts and materials in the activity to those around you?”. The theme "Relations between Science and Nature Activities and Daily Life" was created based on the interview question. The theme was divided into sub-themes as "things made with milk, analogies related to blood circulation, reminders of the compass, and uses of stones". In the descriptive analyses conducted according to the interviews, codes such as "clock, hose, pudding, yogurt, rice pudding, cake, map, compass, white stones, glass, castle, cherry juice, horse, water, cheese, cream, color of tea, and pipe" were determined from the relationships that children were able to establish in the activities.

After the interviews, which are among the qualitative data of the study, were analysed, the opinion of another independent researcher was taken to ensure its reliability. The independent researcher is a preschool teacher pursuing her master's degree. For the calculation of reliability, the formula of Reliability = Consensus/ (Agreement + Disagreement) x 100 was used in Miles and Huberman's (1994) research. A separate theme was created for each question. Reliability results are presented in Table 4.

The reliability scores were 87% for the theme of What is Remembered from Science and Nature Activities, 100% for the theme of What is Felt in Science and Nature Activities, 84% for the theme of Tasks Performed in Science and Nature Activities, and 83% for the theme of Relationships between Science and Nature Activities and Daily Life. The mean reliability value was obtained as 88%. According to Miles and Huberman (1994), when the mean value is above 70%, it is accepted that the reliability of their coding is high. Accordingly, it can be said that the reliability of the determined coding and application is high.

Strengths of Context-Based Science and Nature Activities

Context-based science and nature activities provide permanence in learning as they consist of practices associated with daily life. Since the activities are prepared in accordance with the context-based learning stages and the stages complement each other, integrity is formed in the activities. The use of visuals in stages, the activeness of children in the process and the use of different materials are important points in terms of learning. In science and nature activities prepared according to the four-stage model of

context-based learning, the visual related to the subject is presented first. Children are directed to ask questions about the presented image and planning is made accordingly. Then, the activity related to the visual in the introduction is applied. Finally, children are provided to establish a relationship between the visual at the entrance and the activity in development and to associate them with their own lives. Science and nature activities prepared in this direction attract the attention of preschool children and increase their participation in activities. Different materials prepared, animations and applications increase the curiosity and motivation of children. Children, whose interest and motivation towards the activity increase, actively participate in the activity. In the process they participate in, children use the skills of observation, classification, measurement, estimation and inference according to the content of the applications. Thus, it has been seen that context-based science and nature activities contribute to the acquisition of basic process skills in children.

Aspects of Context-Based Science and Nature Activities Open to Improvement or Change

The aspects of context-based activities that are open to improvement and change based on the situations experienced in the activities are listed below:

- In context-based science and nature activities, basic process skills should be given more clearly in the activity.
- In the activity, the researcher should be in the same context as the participants. For example, when brushing teeth, the researcher should use a toothbrush in the same context as the children.
- While preparing the materials, it is necessary to check their durability and suitability for the level of children.
- Care should be taken to organize the practices in the activity according to the context-based learning stages and to fully reflect the context-based stages of the activity.
- The preparation of applications suitable for the basic process skills discussed in the activity is necessary for gaining the skill.
- In order for the activity to be suitable for context-based learning, the stages in the activity must form integrity.

Discussion and Conclusion

In the study, it was aimed to acquire preschool children basic process skills with science and nature activities by using the Context-Based Four-Stage Learning Model. It has been seen that context-based science and nature activities contribute to children's learning of subjects and concepts and gaining basic process skills. It has been observed that the activity materials keep the children's interests alive. It was concluded that the researcher should plan remarkable materials and activities in practice, based on the existing problems experienced by the teacher and preschool students during the application process. When the video recordings of the applications made in the classroom were examined, it was determined that the children were active in the activities, were willing to talk and were curious about the applications. The materials, practices and activities used in the context-based science and nature activities supported children's participation in the activity and increased their curiosity. For this reason, it is

important that children take part in active activities (Bülbül, 2013). It is emphasized that the application of different materials and innovative approaches in preschool education will increase the quality and efficiency of preschool education (Ibragimovna, 2021).

The materials used in the applications support children in understanding the concepts better (Ayvacı, Er Nas, & Dilber, 2016). It has been determined that the use of materials that enable preschool children to use scientific process skills in science activities (Nayfeld et al., 2011) allows children to interact with science, to question, and to activate their sense of curiosity (Greenfield et al., 2009; Saçkes et al., 2011). Applications that attract students' interest make students more willing to learn (Ramsden, 1997). It has been proven in studies that it is possible to provide high-quality science teaching with different methods and materials (Blank, 2012; Hamre et al., 2013). The utilisation of augmented reality technology in the pedagogy of scientific process skills has been demonstrated to engender an enhancement in the attitudes of preschool children towards science and their own scientific skills (Zhufeng & Sitthiworachart, 2024). Furthermore, an observation was made of a positive relationship between creativity and scientific process skills (Yıldız & Güler Yıldız, 2021). Early childhood educators have been shown to possess a firm grasp of scientific process skills, and their influence on children's attitudes towards science has been demonstrated to be a positive one (Kotaman & İnceoğlu, 2024). In another study, it was concluded that course materials and context-based practices were effective in increasing the interest of the study group (Ültay, 2014). It can be said that the studies conducted in this direction and the application of interesting materials and different models/approaches/methods in science activities of the current study will make science education more enthusiastic.

The study was implemented according to the Four-Stage Model of Context-Based Learning. The results of the study show that context-based science and nature activities are effective in gaining the basic process skills of preschool children. Basic process skills are included at different levels in each activity. It has been noticed that the development of basic process skills is evident in activities that attract children's attention. It was concluded that most of the children showed different levels of development in their observation, classification, measurement and estimation skills. It was observed that very few students were able to make inferences at a low level, while other children did not develop. In general, it has been concluded that context-based science and nature activities are beneficial in terms of gaining basic process skills and improving children's basic process skills. Learning is effective and permanent as a result of the completion of the stages of introduction, curiosity-planning, development and relationship building (Çepni et al., 2019). Similarly, it has been stated that creating and developing curiosity through methods such as connecting children between content and experiences in science activities and asking questions makes it more effective for them to acquire science activities and basic process skills (Vitiello et al., 2019). Kirman Bilgin and Yiğit (2017) stated that the context-based practices they carried out in their studies were effective in learning science subjects for children. In another study, it was concluded that preschool children who received inquiry-based engineering education increased their knowledge of science and developed scientific understanding and scientific skills (Lin et al., 2021). It is emphasized that associating concepts with events in daily life facilitates learning (Hoffman & Demuth, 2007). In this respect, it can be

said that context-based activities contribute to the development of children's basic process skills.

The target area of the applications developed according to context-based learning is the basic process skills of the students. The fact that real-life studies support observation, estimation, measurement, classification and inference skills that can be used in real life contributes to the development of students' basic process skills. In this study, context-based science and nature activities developed in this direction contributed to the development of preschool children's basic process skills. In the interviews with the children, it was concluded that they were excited, curious and found the activities tiring. In the interviews, the children stated different job descriptions. Accordingly, the processes and skills that children participated in during the activity were included in their job descriptions. From the answers given by the children about the tasks they have done in the activities, it is concluded that they are the skills they have gained by participating in the activities in the process. It was concluded that each of the children gave different answers, and therefore each child formed different relationships with the activities. It is concluded that the relationships they establish are related to different perspectives the situations in which they are affected by their lives or the objects they encounter. Researchers' observations and knowledge of children's personal lives lead the researcher to the conclusion that they answer questions by connecting with children's lives. It is seen that the studies carried out support the results obtained. It is emphasized that in preschool science activities, it is important for children to connect with their daily lives in order to analyse knowledge instead of teaching it directly. Connecting with life helps children explore the myriad opportunities every day to develop their scientific skills (Larimore, 2020). It has been stated that preschool teachers need to make connections with their daily lives by enabling them to make sense of small pieces of information they teach children (Fleer et al., 2015). The purpose of context-based learning is to present concepts with examples from daily life, to increase students' motivation, to make students realize the relationship between real life subjects and science, and to develop students' scientific process skills (Sözbilir, Sadi, Kutu, & Yıldırım, 2007). Concretization of science subjects by connecting with daily life contributes to students' understanding and structuring of knowledge (Derman & Badeli, 2017). The results obtained from the study and other studies emphasize the effectiveness and permanence of presenting science activities and developing basic scientific skills in preschool by establishing a connection with daily life.

In line with the findings about the strengths of context-based science and nature activities, context-based activities ensured the permanence of such activities in learning, as they consisted of practices associated with daily life. Since the activities were prepared according to the context-based learning stages, the integrity of the stages took place. The use of visuals during the activity stages, the activeness of the children in the process and the use of different materials in the activities contributed to the children’s learning. Encouraging children to ask questions about the visual and to plan increased their motivation. Children participated actively in the activity with the implementation of the visual development at the introduction to the activities. In addition, the concept of children's establishing a relationship with their own lives has proven that they learn with integrity. As a result, it was concluded that context-based science and nature activities attracted students' attention and increased their participation in the lesson. Prepared

materials, animations and practices increased the curiosity and motivation of children and enabled them to participate in the activity. Children with active participation gained the skills of observation, estimation, measurement, classification and inference according to the content of the applications. It has been seen that context-based science and nature activities are beneficial for preschool students to gain basic process skills. Other studies in the literature have reached similar results to the results obtained from the current study. It is important to consider children's interests when choosing contexts in the teaching process, because if children's interests are not taken into account, their attention cannot be drawn to the subject and their interest in the lesson may decrease (Hiscock, 1993). It is stated that a rich, positive and interesting environment should be provided in order to provide preschool children with the opportunity to learn science effectively (Larimore, 2020). Children should feel that their views are valued and their self-confidence and identity development as science students should be supported (Andersson & Gullberg, 2014). When preschool teachers are also motivating and supportive; The identity development of children as a scientist is positively affected and an effective learning environment is created (Lee, 2017). In addition, children's social and emotional development is also positively affected (Klemm & Neuhaus, 2017). In this way, the increased interest and motivation towards science in children enables children to bring their past experiences and knowledge to the classroom (Dunac & Demir, 2017) and to understand the importance of science (Areljung et al., 2017). In this way, children try to seize opportunities to focus on various experiences related to science around them and continue to develop science with high motivation by taking science into their lives (Schwarz et al., 2017). In line with the results obtained from the studies and the current study, it has been seen that context-based activities that prioritize children's activity and increase their interest and motivation contribute to the development of basic process skills.

Suggestions

Applications made according to context-based learning are applications that target daily life, and this research has been prepared in line with the needs by considering the level, environmental conditions, education level, socio-economic status, developmental status, interests and wifirst researchers of the working group. In future studies, studies should be carried out by considering different variables and appropriate contexts should be selected.

The researcher planned his activities only in the classroom environment. Since context-based learning supports the natural environment, it should be considered that when planning research in this direction, it may be beneficial for the development of children to include application environments such as different areas, natural environments and school gardens.

In this research, the researcher sometimes tried to explain the material suitable for the activity without using it himself. It can be difficult for preschoolers to visualize a situation in their minds. For this reason, it is recommended that the researcher should take care to use the same materials in the same context as the participants during the application.

The participants were distracted during the activity because the researcher read the story for a long time in the first activity and the stages took longer in the next

activity. For this reason, it should be considered that every stage of the activities should be remarkable and should be kept short.

It has been determined by the committee that the practices in some activities are not suitable for the skill to be gained, and that the skill cannot be gained by the participants. Therefore, practices that will facilitate the acquisition of the basic process skills to be gained in the activity should be discussed.

Preschool teachers aiming to develop basic process skills should focus on context-based science activities. Engaging in nature-related activities can be an effective way to achieve this. These types of activities help children explore scientific concepts in a real-world context. By integrating nature into lessons, teachers can enhance their students' learning experiences and skills.

Acknowledgements

Authors are not funded by any institution.

Statement of Responsibility

Conceptualization: [Hatice Altınok]; Methodology and validation: [Hatice Altınok & Bülent Aydoğru]; Formal analysis and investigation: [Hatice Altınok & Bülent Aydoğdu]; Writing - original draft preparation: [Fatma Betül Şenol]; Writing - review and editing: [Fatma Betül Şenol]; Supervision: [Fatma Betül Şenol & Bülent Aydoğdu] Conflicts of Interest No potential competing interest was reported by the authors.

Conflicts of Interest

There is no conflict of interest

References

Abd Rauf, R. A., Rasul, M. S., Mans, A. N., Othman, Z., & Lynd, N. (2013). Inculcation of science process skills in a science classroom. *Asian Social Science*, *9*(8), 1911-2017.

Afandi, A., Sajidan, S., Akhyar, M., & Suryani, N. (2019). Development frameworks of the Indonesian partnership 21st-century skills standards for prospective science teachers: A Delphi Study. *Jurnal Pendidikan IPA Indonesia*, *8*(1), 89-100.

Altınok, H. (2020). Okul öncesi çocuklarına bağlam temelli fen ve doğa etkinlikleri ile temel becerilerin kazandırılmasına yönelik bir araştırma [Unpublished Master Thesis]. Afyon Kocatepe Ünivesitesi, Afyon.

American Association for the Advancement of Science (1997). University of Maryland, *Second Report of the Information Clearinghouse of New Science Curricula*.

Andersson, K., & Gullberg, A. (2014). What is science in preschool and what do teachers have to know to empower children?. *Cultural studies of science education*, *9*, 275-296.

Areljung, S., Ottander, C., & Due, K. (2017). 'Drawing the leaves anyway': Teachers embracing children's different ways of knowing in preschool science practice. *Research in Science Education, 47*, 1173-1192.

Aydoğdu, B. & Karakuş, F. (2017). Okul öncesi öğrencilerinin temel becerileri: bir ölçek geliştirme çalişmasi. *Kuramsal Eğitimbilim Dergisi, 10*(1), 49-72.

Ayvacı, H. Ş., Er Nas, S. & Dilber, Y. (2016). Bağlam temelli rehber materyallerin öğrencilerin kavramsal anlamalari üzerine etkisi: "İletken ve yalitkan maddeler" örneği. *YYÜ Eğitim Fakültesi Dergisi, 13*(1), 51-78.

Backman, E., Åsberg Johnels, J., & Thunberg, G. (2023). Parental perceptions of social life before and after attending a parent training program for children with complex communication needs: the ComAlong example. *Augmentative and Alternative Communication, 40*(1), 46–56. https://doi.org/10.1080/07434618.2023.2262036

Becker, H. S. (1958). Problems of inference and proof in participant observation. *American Sociological Review, 26*(6), 652-660.

Binnie, A. (2004). Development of a senior physics syllabus in New South Wales. *Physics Education, 39*(6), 490.

Blank, R. K. (2012). What is the impact of decline in science instructional time in elementary school. *Noyce Foundation*. Available at: http://www.csss-science.org/downloads/NAEPElemScienceData.pdf (March 26, 2024)

Bülbül, M. Ş. (2013). A description of a blind student's science process skills through health physics. *European Journal of Physics Education, 4*(2), 6-13.

Cabe Trundle, K. (2015). The inclusion of science in early childhood classrooms. In K. C. Trundle, & M. Saçkes (Eds.), *Research in early childhood science education* (pp. 1-6). Springer.

Choi, H.J. & Johnson, S. D. (2005) The effect of context-based video instruction on learning and motivation in online courses. *The American Journal of Distance Education, 19*(4), 215-227.

Çepni, S., Özmen, H. & Ayvacı, H. Ş. (2019). *Yaşam (bağlam) temelli, beyin temelli öğrenme kuramlari, 21.yüzyil becerileri ve fetemm yaklaşimi ve fen bilimleri öğretimindeki uygulamalari.* In S. Çepni (Ed), Kuramdan uygulamaya fen ve teknoloji öğretimi (14. Baskı) (pp. 123-186). Pegem Akademi.

Çilenti, K. (1985). *Fen eğitimi teknolojisi* (1. Baskı). Kadıoğlu Matbaası.

Derman, A. & Badeli, Ö. (2017). İlkokul 4. sinif "saf madde ve karişim" konusunun öğretiminde 5e modeli ile desteklenen bağlam temelli öğretim yönteminin öğrencilerin kavramsal anlamalarina ve fene yönelik tutumlarina etkisinin incelenmesi. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 17*(4), 1860-1881.

Dunac, P. S., & Demir, K. (2017). Negotiating White science in a racially and ethnically diverse United States. *Educational Review, 69*(1), 25-50.

Ekiz, D. (2020). Bilimsel araştirma yöntemleri (6. Baskı.). Anı.

Erkoca Akköse, E. (2008). *Okulöncesi eğitimi fen etkinliklerinde doğa olaylarinin neden sonuç ilişkilerini belirlemede yaratici dramanin etkililiği* [Unpublished Master Thessis]. Anadolu Üniversitesi Eğitim Bilimleri Enstitüsü, Eskişehir.

Eshach H. (2006). Science literacy in primary schools and pre-schools. *Moment, Eurasia J. Math Sci& Tech. Ed, 3*(2), 167-169.

Fleer, M. (2015). *Science for children*. Cambridge University Press.

Flowerdew, J. (1992). Definitions in science lectures. *Applied Linguistics, 13*(2), 202-221.

Gilbert, J. K. (2006). On the nature of "context" in chemical education. *International Journal of Science Education, 28*(9), 957-976.

Gürgür, H. (2016) Eylem araştırması. In A. Saban & A. Ersoy (Ed.), *Eğitimde nitel araştirma desenleri* (1. Baskı). (pp. 31-48). Anı.

Greenfield, D. B., Jirout, J., Dominguez, X., Greenberg, A., Maier, M., & Fuccillo, J. (2009). Science in the preschool classroom: A programmatic research agenda to improve science readiness. *Early Education and Development*, *20*(2), 238-264.

Hamre, B. K., Pianta, R. C., Downer, J. T., DeCoster, J., Mashburn, A. J., Jones, S. M., ... & Hamagami, A. (2013). Teaching through interactions: Testing a developmental framework of teacher effectiveness in over 4,000 classrooms. *The Elementary School Journal*, *113*(4), 461-487.

Hiscock, K. (1993). *The effects of context on solving estimation word problems in children* [Unpublished Master Thessis]. Cartelon University, Canada.

Hoffman, D. & Demuth, R. (2007). Chemie in kontext in der hauptschule-geht den das? der mathematische und naturwissenschaftliche. *Unterricht-MNU, 60*(5), 299-303.

Houser, J. (2015). *Nursing research: reading, using, and creating evidence*. Jones and Bartlett Learning.

Ibragimovna, R. Y. (2021). Cognitive and Social Outcomes Of Project-Based Learning. *JournalNX*, 521-524.

Johnson, A. P. (2015). *Eylem araştirmasi el kitabı* (2. Baskı). (Translation editors: Y. Uzuner & M. Özten Anay). Anı.

Jirout, J., & Zimmerman, C. (2015). Development of science process skills in the early childhood years. In K. C. Trundle, & M. Saçkes (Eds.), *Research in early childhood science education* (pp. 143-165). Springer.

Kalafati, M., Flogaiti, E., & Daskolia, M. (2025). Enhancing preschoolers' creativity through art-based environmental education for sustainability. *Environmental Education Research, 31*(1), 46-73.

King, D., Winner, E. & Ginns, I. (2011). Outcomes and implications of one teacher's approach to context-based science in the middle years. *Teaching Science, 57*(2), 26-34.

Kirman Bilgin, A. & Yiğit, N. (2017). Öğrencilerin "maddenin tanecikli yapisi" konusu ile bağlamlari ilişkilendirme durumlarinin incelenmesi. *Mersin Üniversitesi Eğitim Fakültesi Dergisi, 13*(1), 303-322.

Klemm, J., & Neuhaus, B. J. (2017). The role of involvement and emotional well-being for preschool children's scientific observation competency in biology. *International Journal of Science Education, 39*(7), 863-876.

Kotaman, H., & İnceoğlu, S. Ö. (2024). Impact of kindergarten teachers' scientific processing skills training on children's science and mathematics development. *Early Years*, *45*(2), 1-15.

Larimore, R. A. (2020). Preschool science education: A vision for the future. *Early Childhood Education Journal*, *48*(6), 703-714.

Lin, X., Yang, W., Wu, L., Zhu, L., Wu, D., & Li, H. (2021). Using an inquiry-based science and engineering program to promote science knowledge, problem-solving skills and approaches to learning in preschool children. *Early Education and Development*, *32*(5), 695-713.

Lee, J. E. (2017). Preschool teachers' pedagogical content knowledge in mathematics. *International Journal of Early Childhood*, *49*, 229-243.

Maryanti, R. I. N. A., Rahayu, N. I., Muktiarni, M., Al Husaeni, D. F., Hufad, A. C. H. M. A. D., Sunardi, S., & Nandiyanto, A. B. D. (2022). Sustainable development goals (SDGs) in science education: Definition, literature review, and bibliometric analysis. *Journal of Engineering Science and Technology*, *17*, 161-181.

Mays, N., & Pope, C. (2000). Qualitative research in health care, assessing quality in qualitative research. *BMJ*, *320*, 50-52.

McFarlin, L. M. (2011). *How children in a science-centered preschool use science process skills while engaged in play activities* [Doctoral Dissertation]. The University of Texas, Austin.

McNiff, J. (2013). *Action research: Principles and practice*. Routledge.

Miles, M. B. & Huberman A.M. (1994). *An expanded sourcebook qualitative data analysis* (2th ed.). Sage.

Millî Eğitim Bakanlığı (2017). *Fen bilimleri dersi öğretim programi* (1. Baskı). Ankara.

Ministry of National Education Preschool Education Program (MoNE) (2024). *Ministry of National Education Pre-School Education Programme.* https://tegm.meb.gov.tr/meb_iys_dosyalar/2024_09/20104013_2024programokuloncesionayli.pdf

Moyles, J. (2002). Observation as a research tool. In M. Coleman & A. R. J. Briggs (Eds.), *Research methods in educational leadership and management* (pp. 172-195). Sage.

Narimanovna, N. E. (2024). Stages of development of communication skills in young children. *International Scientific Research Conference*, *3*(26), 46-50.

Nayfeld, I., Brenneman, K., & Gelman, R. (2011). Science in the classroom: Finding a balance between autonomous exploration and teacher-led instruction in preschool settings. *Early Education & Development*, *22*(6), 970-988.

Rajagopalan, I. (2019). Concept of Teaching. *Shanlax International Journal of Education*, *7*(2), 5-8.

Ramsden, J. M. (1997). How does a context-based approach influence understanding of key chemical ideas at 16+? *International Journal of Science Education*, *19*(6), 697-710.

Saat, R. M. (2004). The acguistion of integrated science process skills in a web-based learning enviroment. *Research in Science & Technological Education*, *22*(1), 23-40.

Saçkes, M., Trundle, K. C., Bell, R. L., & O'Connell, A. A. (2011). The influence of early science experience in kindergarten on children's immediate and later science achievement: Evidence from the early childhood longitudinal study. *Journal of Research in Science Teaching*, *48*(2), 217-235.

Sözbilir, M., Sadi, S., Kutu, H. & Yıldırım, A. (2007). Kimya eğitiminde içeriğe/ bağlama dayali (context-ased) öğretim yaklaşimi ve dünyadaki uygulamalari. I. *Ulusal Kimya Eğitimi Kongresi*, 20-22 Haziran, p. 108.

Schwarz, C. V., Passmore, C., & Reiser, B. J. (2017). *Helping students make sense of the world using next generation science and engineering practices*. NSTA Press.

Stringer, E. T. (2013). *Action research* (4th ed.). Sage.

Ültay, E. (2014). *İtme, momentum ve çarpişmalar konusuyla ilgili bağlam temelli öğrenme yaklaşimina dayali açiklama destekli REACT stratejisine göre geliştirilen etkinliklerin etkisinin araştirilmasi* [Unpublished Doctoral Thesis]. Karadeniz Teknik Üniversitesi Eğitim Bilimleri Enstitüsü, Trabzon.

Wellington, J. (1994). *Secondary science. contemporary issues and practical approaches* (1st ed.). Routledge.

Vitiello, V. E., Whittaker, J. V., Mulcahy, C., Kinzie, M. B., & Helferstay, L. (2019). Reliability and validity of the preschool science observation measure. *Early Education and Development*, *30*(2), 196-215.

Yam, H. (2005). What is contextual learning and teaching in physics? Http://Www.Phy.Cuhk.Edu.Hk/Contextual/Approach/Tem/Brief_E.Html

Yıldırım, A. & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştirma yöntemleri* (11. Baskı). Seçkin.

Yıldız, C., & Yıldız, T. G. (2021). Exploring the relationship between creative thinking and scientific process skills of preschool children. *Thinking Skills and Creativity*, *39*, 100795.

Zhufeng, Y., & Sitthiworachart, J. (2024). Effect of augmented reality technology on learning behavior and attitudes of preschool students in science activities. *Education and Information Technologies*, *29*(4), 4763-4784.